CLAIMS

I claim:

1. A method of modeling seismic data, comprising:

deriving a time-lapse data set from a first seismic data set and a second seismic data set;

deriving a forward-modeled time-lapse data set including a plurality of values;

sorting the plurality of values into a plurality of bins corresponding to the forward-modeled time-lapse data set;

selecting a plurality of optimal values from the plurality of bins;

mapping the plurality of optimal values in correspondence with a plurality of subterranean locations using the time-lapse data set;

calibrating the plurality of optimal values; and

plotting the plurality of calibrated optimal values.

2. The method of claim 1, and wherein the deriving the forward-modeled time-lapse data set is defined by deriving the forward-modeled time-lapse data set using at least one rock physics relationship.

3. The method of claim 1, and further comprising acquiring the first seismic data set and thereafter acquiring the second seismic data set.

4. The method of claim 1, and wherein the first seismic data set and the second seismic data set both include amplitude-versus-offset signal data.

5. The method of claim 1, and wherein the first seismic data set and the second seismic data set both include amplitude-versus-angle signal data.

6. The method of claim 1, and wherein the first seismic data set and the second seismic data set both include data corresponding to reflected acoustic wave energy.

7. The method of claim 1, and wherein the deriving the forward-modeled time-lapse data set is defined by deriving the forward-modeled time-lapse data set using respectively selected pore pressure and saturation and porosity relationships.

8. The method of claim 1, and wherein the deriving the time-lapse data set is defined by calibrating each of the first seismic data set and the second seismic data set and thereafter subtracting the calibrated second seismic data set from the calibrated first seismic data set.

9. The method of claim 1, and wherein the deriving the time-lapse data set is defined by inverting and then calibrating each of the first seismic data set and the second seismic data set and thereafter subtracting the calibrated inverted second seismic data set from the calibrated inverted first seismic data set.

10. The method of claim 1, and wherein the plotting the calibrated values is defined by plotting the calibrated values to visually represent a spatial distribution of at least one physical characteristic of a subterranean hydrocarbon reservoir.

11. The method of claim 1, and wherein the selecting the plurality of optimal values sorted into the plurality of bins is performed in response to comparing the plurality of values with at least one comparison value, and wherein the at least one comparison value optionally includes a reservoir measurement value.

12. The method of claim 1, and wherein the calibrating the plurality of optimal values is performed in response to comparing the plurality of optimal values with at least one comparison value, and wherein the at least one comparison value optionally includes a reservoir measurement value.

13. A method of modeling seismic data corresponding to a subterranean reservoir containing hydrocarbons, comprising:

calibrating each of a first seismic data set and a second seismic data set;

subtracting the calibrated second seismic data set from the calibrated first seismic data set to derive a time-lapse data set;

deriving a forward-modeled time-lapse data set including a plurality of physical parametric values;

sorting the plurality of physical parametric values into a plurality of bins corresponding to the forward-modeled time-lapse data set;

selecting a plurality of optimal physical parametric values from the plurality of bins of physical parametric values;

mapping the plurality of optimal physical parametric values to a corresponding plurality of subterranean locations using the time-lapse data set;

calibrating the plurality of optimal physical parametric values; and

plotting the plurality of calibrated optimal physical parametric values as a visual representation of the subterranean reservoir containing hydrocarbons.

14. The method of claim 13, and wherein:

the calibrating each of the first seismic data set and the second seismic data set is performed in response to comparing each of the first seismic data set and the second seismic data set with at least one comparison value; and

the at least one comparison value optionally includes a reservoir measurement value.

15. The method of claim 13, and wherein the first seismic data set and the second seismic data are respectively defined by an inverted first seismic data set and an inverted second seismic data set.

16. The method of claim 13, and wherein the deriving the forward-modeled time-lapse data set is defined by deriving the forward-modeled time-lapse data set using a rock physics relationship.

17. The method of claim 16, and wherein the rock physics relationship corresponds to a selected one of a pressure relationship, a saturation relationship, or a porosity relationship.

18. The method of claim 13, and wherein the selecting the plurality of optimal physical parametric values sorted into the plurality of bins is performed in response to comparing the plurality of physical parametric values with at least one comparison value, and wherein the at least one comparison value optionally includes a reservoir measurement value.

19. The method of claim 13, and wherein the calibrating the plurality of optimal physical parametric values is performed in response to comparing the plurality of optimal physical parametric values with at least one comparison value, and wherein the at least one comparison value optionally includes a reservoir measurement value.

20. The method of claim 13, and wherein the first seismic data set and the second seismic data set both include amplitude-versus-offset signal data.

21. The method of claim 13, and wherein the first seismic data set and the second seismic data set both include amplitude-versus-angle signal data.

22. The method of claim 13, and wherein the first seismic data set and the second seismic data set both include data corresponding to reflected acoustic wave energy.

23. A computer, comprising:

a processor;

a computer-readable storage medium coupled in data communication with the processor, the computer-readable storage medium storing a first data set and a second data set and a plurality of rock physics relationships and a program code, the program code configured to cause the processor to:

calibrate each of the first data set and the second data set;

subtract the calibrated second data set from the calibrated first data set to derive a time-lapse data set;

calculate a forward-modeled time-lapse data set including a plurality of parametric values using selected ones of the plurality of rock physics relationships;

sort the plurality of parametric values into a plurality of bins corresponding to the forward-modeled time-lapse data set;

select a plurality of optimal parametric values from the plurality of parametric values sorted into the plurality of bins;

map the plurality of optimal parametric values to a corresponding plurality of subterranean locations using the time-lapse data set;

calibrate the plurality of optimal parametric values; and

plot the plurality of calibrated optimal parametric values to visually represent at least one spatially distributed physical characteristic of a subterranean reservoir of hydrocarbons.

24. The computer of claim 23, and wherein the first data set and the second data set stored in the computer-readable storage medium both include one of amplitude-versus-offset data, or amplitude-versus-angle data.

25. The computer of claim 23, and wherein the first data set and the second data set both include data corresponding to reflected acoustic wave energy.

26. The computer of claim 23, and wherein the program code stored within the computer-readable storage medium is further configured to cause the processor to:

compare each of the first data set and the second data set with at least one comparison value; and

calibrate each of the first data set and the second data set in response to the comparing.

27. The computer of claim 23, and wherein the first data set and the second data set are respectively defined by an inverted first data set and an inverted second data set.

28. The computer of claim 23, and wherein the plurality of rock physics relationships stored in the computer-readable storage medium are defined by at least one of pressure relationships, saturation relationships, or porosity relationships.

29. The computer of claim 23, and wherein the program code stored in the computer-readable storage medium is further configured to cause the processor to compare the plurality of parametric values sorted into the plurality of bins with at least one comparison value, and to select the plurality of optimal parametric values in response to the comparing.

30. The computer of claim 29, and wherein the at least one comparison value includes a measurement value corresponding to the subterranean reservoir containing hydrocarbons.

31. The computer of claim 23, and wherein the program code stored in the computer-readable storage medium is further configured to cause the processor to compare the plurality of optimal parametric values with at least one comparison value, and to calibrate the plurality of optimal parametric values in response to the comparing.

32. The computer of claim 31, and wherein the at least one comparison value includes a measurement value corresponding to the subterranean reservoir containing hydrocarbons.

33. The computer of claim 23, and wherein the program code stored in the computer-readable storage medium is further configured to cause the processor to plot the plurality of optimal parametric values selectively using one of a monitor or a printer coupled to the computer.

34. The computer of claim 23, and wherein the at least one spatially distributed physical characteristic of the subterranean reservoir containing hydrocarbons is defined by at least one of a porosity, a pressure, or a saturation.